143A AMPLIFIER
INPUT CIRCUIT VARIATIONS

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1. GENERAL

1.01 This section is issued to describe a number of variations in the input circuit of the 143A amplifier. The use of the circuit is described, and also the properties of the entire amplifier when these input arrangements are used. Some of these variations are available as 143B or 143C amplifiers as covered in Section 024-107-100, but are included for reasons stated below. Other arrangements must be assembled locally as required.

1.02 This section should aid materially where a customer's requirements may necessitate modification of an available model of the 143-type amplifier, or one of the models which must be installed.

1.03 A description of the parts needed for the modifications, and instructions for mounting the components are included.

1.04 Several of the variations refer to the use of the 116B preamplifier. A description of the latter is contained in Section 024-104-100.

2. CIRCUIT DESCRIPTION

2.01 Figs. 1A and 1B show a number of variations in the input circuit of the 143A amplifier. The use of each circuit will be described, and also the properties of the entire amplifier when these input arrangements are used. Information on source impedance is given in Figs. 1a and 1b. When no range of impedance is given, the latter may vary from the nominal value by ± 40 per cent without appreciable change in the frequency characteristics.

Standard 143A Amplifier

2.02 This amplifier, as explained in Section 024-107-100, is basic to the series of the 143 type. As shipped, this amplifier provides for two high impedance inputs. The electrical characteristics of this amplifier are given in Section 024-107-100.

Variation 1

2.03 This variation adds a 141A preamplifier. It is used when a low level input is required for microphone or other low level device. This circuit is the same as that of the 143B amplifier, and its characteristics are given in Section 024-107-100.

Variation 2

2.04 This variation adds a 618D input transformer. The latter has a single electrostatic shield between windings and may be used when a line level input is required for connection to telephone lines or other sources of comparable level. This circuit is the same as that of the 143C amplifier and its characteristics may be found in Section 024-107-100.

Variation 3

2.05 This variation adds a 618C input transformer. It may be used when a line level input is required which may be operated from a large range of source impedances.

Gain - High gain input - provides approximately 72 db gain from a 600-ohm source.

Bridging input - provides approximately 59 db gain from a 600-ohm source.

Gain Control - Master potentiometer in 143A amplifier.

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Variation 4

2.06 This variation adds a 285S input transformer which has double electrostatic shields between windings. It may be used in place of the 618D input transformer of Variation 2 when a high quality balanced and shielded input circuit may aid in the reduction of crosstalk when operating from telephone lines.

Gain - Approximately 66 db from 600-ohm source.

Gain Control - Master potentiometer in 1A3A amplifier.

Variation 5

2.07 This variation adds one 116B preamplifier (see Paragraph 1.04) and its associated gain control. It may be used when one low level input is required for operation from a low level device. The gain control potentiometer may be remotely located from the amplifier if preferred.

Gain - Approximately 107 db.

Gain Control - Potentiometer associated with 116B preamplifier. Master potentiometer in 1A3A amplifier.

Variation 6

2.08 This variation adds two 116B preamplifiers and their associated gain controls. It is used when two low level inputs are required for operation from low level devices. The two inputs may be operated simultaneously if necessary, or either may be cut off by means of the switch at the minimum gain end of the gain control potentiometer. The latter may be located at a distance from the amplifier if preferred.

Gain - Approximately 107 db.

Gain Control - On individual channels by potentiometers associated with 116B preamplifiers. Master potentiometer in 1A3A amplifier controls both channels.

Variation 7

2.09 This variation adds a 618C input transformer and a gain control potentiometer having 38 db of control in 2 db steps. It may be used in place of Variation 3 when a stepped gain control is required.

Gain - Approximately 70 db from 600-ohm source (high gain input).

Gain Controls - 19 steps, 2 db per step and "Off." Master potentiometer in 1A3A amplifier.

Variation 8

2.10 This variation adds a 116B preamplifier and a transformer. It may be used when a low level input and also a line level input are required. It consists of a combination of Variation 5 with Variation 2, 3 or 4, and the characteristics are the same as given for these variations.

3. LIST OF PARTS

3.01 The items required for the several circuit variations are listed in Figs. 1A and 1B in somewhat abbreviated form. These items will be described in more detail. Suitable substitutes, of course, may be used. Certain items included are not specified in Figs. 1A and 1B, but may be useful if associated panels or brackets are used for mounting them.

3.02 Potentiometer with switch attached - 1 - Allen Bradley, Type JS, U4022, FS-2040, 4000-ohm potentiometer with M2898 lockwasher and M2786 nut. This is the gain control for the 116B preamplifier when a short shaft (5/8 in.) is required for panel mounting. This item is not required in any arrangement shown in Figs. 1A and 1B, but will be useful if remote gain controls are employed with 116B preamplifiers. See also Mounting Instruction F.

3.03 Potentiometer with switch attached - Item 1 - 1 Allen Bradley, Type JS, U4022, FS-3232, 4000-ohm potentiometer with M2898 lockwasher and M2786 nut. This is the gain control for the 116B preamplifier, with a long shaft (2-1/2 in.) for rack use.

3.04 Knob - Item 2 - 1 - Kurz-Kasch No. 292-3L knob. This is used with the potentiometer.

3.05 Attenuator - 1 - Tech-Lab. No. A-1330-2 attenuator. This is a stepped attenuator, 19 steps of 2 db each and "off" position, 250,000 ohms with designation plate, and with a short shaft (5/8 in.). If this attenuator is used externally as with a horizontally mounted amplifier, its location should be such that short wires are used to it as discussed under wiring.

3.06 Attenuator - Item 3 - 1 - Tech-Lab. No. A-1330-1 attenuator. This is the same as the above except that a long shaft (2-1/4 in.) is furnished for rack use.

3.07 Mounting - Item 4 - When a 618-type input transformer is to be mounted, the following hardware is required:

1 - Aerovox mounting ring, type E, 1-1/2 in. diameter.

1 - 6/32 in. by 1-1/4 in. round head machine screws.

2 - 6/32 in. by 3/8 in. round head machine screws.

3 - 6/32 nuts and lockwashers.

3.08 Bushing - Item 5 - 1 - Mallory UB2A1 bushing and nut. This is a bushing to mount in a 13/32 in. hole and accommodate a 1/4 in. shaft. It should be used in the 407B-15 panel when the long shafts of potentiometers, etc., extend through this panel.

3.09 Panel - Item 6 - 1 - 407B-15 panel. This is an aluminum gray panel, 12-1/4 in. high, for use as a front mat when a 143A amplifier is rack mounted.

4. MOUNTING ARRANGEMENTS

4.01 Provision is made to mount additional equipment on the input end of the 143A amplifier in two removable plates and in several extra mounting holes in the chassis. A 141A preamplifier may be mounted in place of the two removable plates; a 116B preamplifier may be mounted in place of either of the plates. In addition the under side of each plate is marked with drilling instructions for mounting transformers, potentiometers and switches. The extra holes in the chassis may be used to mount two potentiometers or one switch and one potentiometer.

4.02 The following gives detailed instructions for mounting the equipment required for the input circuit arrangements shown in the chart in Figs. 1A and 1B. In this chart, each circuit has accompanying diagrams showing the location of the extra equipment for rack mounting of the 143A amplifier, and reference to mounting instructions given in this section. In addition, the chart shows location of equipment for horizontal mounting of the amplifier for Variation 1 to Variation 4. No provision is made in the 143A amplifier for mounting the controls of Variation 5 to Variation 8 on the chassis if the amplifier is mounted horizontally. If such arrangements are wanted, the controls must be mounted on a separate panel or bracket. The attenuator of Variation 7 must be mounted close to the associated equipment because the high impedance wiring must be kept short. This limitation does not apply to the potentiometers of Variations 5, 6 and 8, which may be located at a distance from the amplifier.

4.03 Tools which may be required for this work are standard screwdrivers and wrenches, a No. 8 Allen wrench for the set screws in the knobs, and a small Phillips screwdriver. In some cases a means of drilling holes in metal panels will be required.

Mounting Instruction A - Rack Mounted 143A Amplifier

4.04 When the 143A amplifier is to be rack mounted, a 407B-15 panel is used as a front mat. Since the 143A amplifier as shipped has its power switch and volume control on the side of the chassis in a position for horizontal mounting, it is necessary to rotate these controls 90° to a position where they will be available through the cutout in the 407B-15 panel. This may be done as follows:

(a) Remove the knob of the volume control by loosening its set screw with a No. 8 Allen wrench.

(b) Remove the etched plate by removing the four No. 4 Phillips screws holding it in position. This loosens the bracket holding the controls.

(c) The bracket should now be rotated 90° to its mounting position on the two mounting spacers on the chassis. Two No. 8 screws furnished with the 407B-15 panel should be passed through these spacers and into the tapped holes in the bracket.

(d) Fasten the etched plate to the bracket with the four No. 4 screws removed in Step (b), and replace the volume control knob.

(e) The holes in the chassis through which the controls formerly protruded should be closed with the plug buttons supplied with the 407B-15 panel.

4.05 The rear of the 407B-15 panel is marked with drilling information for holes that are in line with certain mounting holes on the amplifier. This is for use only when additional parts are mounted on the chassis as described below.

Mounting Instruction B - 1l1A Preamplifier

4.06 To mount a 1l1A preamplifier on the 1l3A amplifier chassis, first remove the two blank cover plates near the input end of the chassis. The 1l1A preamplifier is mounted in place of these plates on top of the chassis and oriented so that the electron tubes are toward the end of the chassis. Mounting screws, lockwashers and plain washers are furnished with the 1l1A preamplifier.

Mounting Instruction C - 116B Preamplifier

4.07 One or two 116B preamplifiers may be mounted on the 1l3A amplifier chassis, each in place of one of the blank cover plates on the chassis. Remove the cover plate and place the 116B preamplifier in its place on top of the chassis, with the input transformer toward the side of the chassis where the controls are mounted. Mounting screws and washers are furnished with the 116B preamplifier.

Mounting Instruction D - 713-Type Apparatus Units

4.08 The 713A apparatus unit may be mounted in place of either of the blank cover plates. Four screws are furnished with the apparatus unit as mounting screws.

Mounting Instruction E - 618-Type Input Transformer

4.09 A 618-type input transformer may be mounted on the chassis which is drilled for wires and mounting screws. The transformer is held in place by an Aerovox Type E, 1-1/2 in. diameter mounting ring, held tight with a 6/32 in. by 1-1/4 in. round head machine screw and associated nut and lockwasher. The mounting ring is fastened to the chassis by two 6/32 in. by 3/8 in. round head machine screws, nuts and lockwashers (see Item 4). This transformer may also be mounted on one of the blank cover plates which, however, must be drilled in accordance with the marking on its under side. The added series resistors with the 618C input transformer (see Variations 3 and 7) may be supported by using spare input terminals of the 1l3A amplifier as discussed under wiring.

Mounting Instruction F - Potentiometers

4.10 Three holes are available in the amplifier chassis next to the cover plates, normally closed with plug buttons; the center hole is for wiring, and either of the others may be used for mounting purposes. The potentiometer (Item 1) is mounted so that the long shaft extends through the front panel. The 407B-15 panel is marked on the rear with drilling information for shaft holes which line up with the end mounting holes of the three in the amplifier chassis. Bushings (Item 5) should be used in these holes to support the shaft. A designation plate may be used on the front of the panel if preferred. Marking is also provided on the rear of the 407B-15 panel for mounting holes for this designation plate.

4.11 Potentiometers for use with the 116B preamplifier may be used as remote controls, if preferred. In any event they may be mounted externally from the 1l3A amplifier, using either the long-shaft unit (Item 1), or a shorter-shaft unit.

Mounting Instruction G - 285-Type Input Transformer

4.12 Some 285-type input transformers (not including the 285S) may be mounted on the chassis which is drilled for wires and mounting screws. The transformer should be fastened to the chassis with two No. 8/32 in. by 3/8 in. screws.

4.13 When the 285S input transformer is mounted on one of the blank plates furnished as a part of the 1l3A amplifier, it will be necessary to drill a hole in the plate in addition to the holes indicated on the plates, as received, for the 285L input transformer.

Mounting Instruction H - Attenuator, Item 3

4.14 The attenuator, used in Variation 7, is arranged for single hole mounting and is supplied with designation plate. It may be mounted through either end hole of the three extra holes in the chassis, with the shaft extending through the front panel. The 407B-15 panel is marked on the rear with drilling information for shaft holes which line up with these mounting holes in the amplifier chassis. A bushing should be used in this hole to support the shaft and hold the designation plate in place. Other mounting than this for this attenuator (or for a shorter-shaft attenuator) requires consideration of lead length as discussed under wiring.

5. WIRING

5.01 The various input arrangements may all be wired with straps on the 1l3A chassis. Variation 1 to Variation 7 have complete connections

shown in the circuits on Figs. 1A and 1B, and may be wired accordingly. Variation 8 has only part of the connections shown. Wiring not shown in Variation 8 should be the same as Variation 5 and Variation 2, 3 or 4.

5.02 The wiring for Variation 3 or 7 will be facilitated if the resistors in series with the primary of the 618C input transformer are wired using spare input terminals of the 143A amplifier as tie points for the ends of the resistors connecting to the transformer. This is indicated schematically in Figs. 1A and 1B.

5.03 If the attenuator of Variation 7 is to be used with a horizontally mounted amplifier, it must be located so that short wires can be used, in order to keep down induction into its high impedance circuit.

INPUT CIRCUIT			TERMINALS - 143A		VERTICAL (RACK) MOUNTING		HORIZONTAL MOUNTING	
ITEM	TERMINALS - 143A	ADDITIONAL CIRCUIT	TERMINAL STRIP	INTERNAL	CHASSIS PLAN	MATERIAL	CHASSIS PLAN	MATERIAL
STANDARD 143A AMPLIFIER	10 20 30 40 50 60 70 80		INPUT NO.1 9 10 INPUT NO.2 11	23 24 26 (GROUND)	BLANK BLANK MOUNTING INSTRUCTION A		BLANK BLANK MOUNTING INSTRUCTION A	
VARIATION 1 (CIRCUIT OF 143B AMPLIFIER)	600Ω 30Ω 250Ω 1 2 3	1 2 3 141A AMPLIFIER 5 6 4 8 7	9 1 10	23 26 (GROUND) 25 (+PLATE) 27 HEATER 28 24	T 141A AMP. MOUNTING INSTRUCTION A,B	1-141A AMPLIFIER 1-6J7 VACUUM TUBE 1-6SN7 VACUUM TUBE 1-PANEL (ITEM 6)	T 141A AMP. MOUNTING INSTRUCTION B	1-141A AMPLIFIER 1-6J7 VACUUM TUBE 1-6SN7 VACUUM TUBE
VARIATION 2 (CIRCUIT OF 143C AMPLIFIER)	600Ω 150Ω 150Ω 37.5Ω 8 7 6 5 4	GR BR BL-WH BL RD-WH GR-WH RD 618D INPUT TRANSFORMER	9 10 11	23 24 26 (GROUND)	618D OR OR MOUNTING INSTRUCTION A,E	1-618D INPUT TRANSFORMER 1-MOUNTING (ITEM 4) OR 1-713A APPARATUS UNIT 1-PANEL (ITEM 6)	618D OR OR MOUNTING INSTRUCTION E	1-618D INPUT TRANSFORMER 1-MOUNTING (ITEM 4) OR 1-713A APPARATUS UNIT
VARIATION 3	300Ω (0-25,000) 600Ω (0-1000) 6 5 4	20000Ω 300Ω BL GR-WH RD-WH GR RD BL-WH 618C INPUT TRANSFORMER	9 10	23 24 26 (GROUND)	OR 618C OR MOUNTING INSTRUCTION A,E	1-618C INPUT TRANSFORMER 1-MOUNTING (ITEM 4) 1-20000Ω 1/2 WATT RESISTOR 1-300Ω 1/2 WATT RESISTOR 1-PANEL (ITEM 6)	OR 618C OR MOUNTING INSTRUCTION E	1-618C INPUT TRANSFORMER 1-MOUNTING (ITEM 4) 1-20000Ω 1/2 WATT RESISTOR 1-300Ω 1/2 WATT RESISTOR
VARIATION 4	600Ω 150Ω 6 5 4	RD GR RD-WH BL BL-WH 2BK 285S INPUT TRANSFORMER	10	23 24 26 (GROUND)	285S OR MOUNTING INSTRUCTION A,G	1-285S INPUT TRANSFORMER 2-.164-32 X 3/8" R.H.M. SCREWS 1-PANEL (ITEM 6)	285S OR MOUNTING INSTRUCTION G	1-285S INPUT TRANSFORMER 2-.164-32 X 3/8" R.H.M. SCREWS

Fig. 1A – 143 Type Amplifier Input Circuit Variations (Sheet 1)

ITEM	INPUT CIRCUIT: TERMINALS-143A	INPUT CIRCUIT: ADDITIONAL CIRCUIT	TERMINALS-143A: TERMINAL STRIP	TERMINALS-143A: INTERNAL	VERTICAL (RACK) MOUNTING: CHASSIS PLAN	VERTICAL (RACK) MOUNTING: MATERIAL	HORIZONTAL MOUNTING: CHASSIS PLAN	HORIZONTAL MOUNTING: MATERIAL
VARIATION 5	120~ (60-250); 30~ (15-60); 1 O, 2 O, 3 O	RD, RD-WH, BL, BL-WH; 116 B AMPLIFIER; GR, RD, BK; OWH; 20000~; 4000~	10, 11	023, 024, 025 (+PLATE), 026 (GROUND), 027, 028 HEATER	POTENT. 116B; MOUNTING INSTRUCTION A,C,F	1-116 B AMPLIFIER 1-1612 VACUUM TUBE 1-POTENT. (ITEM 1) 1-BUSHING (ITEM 5) 1-KNOB (ITEM 2) 1-20000~ 1/2 WATT RESISTOR 1-BL-148165 DESIG. PLATES 1-PANEL (ITEM 6)	NONE RECOMMENDED (SEE MOUNTING INSTRUCTION F)	
VARIATION 6	120~ (60-250); 30~ (15-60); 1 O, 2 O, 3 O; 120~ (60-250); 30~ (15-60); 4 O, 5 O, 6 O	RD, RD-WH, BL, BL-WH; 116 B AMPLIFIER; GR, RD, BK; OWH; 20000~; 4000~	9, 10, 11	023, 024, 025 (+PLATE), 025 (GROUND), 027, 028 HEATERS	POTENT. 116B 116B; MOUNTING INSTRUCTION A,C,F	2-116 B AMPLIFIERS 2-1612 VACUUM TUBES 2-POTENT. (ITEM 1) 2-BUSHINGS (ITEM 5) 2-KNOBS (ITEM 2) 2-20000~ 1/2 WATT RESISTOR 2-BL-148185 DESIG. PLATES 1-PANEL (ITEM 6)	NONE RECOMMENDED (SEE MOUNTING INSTRUCTION F)	
VARIATION 7	600~ (0-25000); 600~ (0-1000); 6 O, 5 O, 4 O	20000~, 300~, BL, RD-WH, GR-WH, GR, RD, BL-WH; 250000~; 2 DB PER STEP (36 DB); 618 C INPUT TRANSFORMER	9, 10, 11	023, 024, 026 (GROUND)	ATTENUATOR 618C; MOUNTING INSTRUCTION A,E,H	1-618C INPUT TRANS. 1-20000~ 1/2 WATT RESISTOR. 1-300~ 1/2 WATT RESISTOR 1-ATTENUATOR (ITEM 3) 1-KNOB (ITEM 2) 1-BUSHING (ITEM 5) 1-PANEL (ITEM 6)	NONE RECOMMENDED (SEE MOUNTING INSTRUCTION H)	
VARIATION 8 (VARIATION 5 PLUS VARIATION 2,3 OR 4)	AVAILABLE: 1 O, 2 O, 3 O, 4 O, 5 O, 6 O, 7 O, 6 O	116 B AMPLIFIER; GR, RD, BK; (SEE VARIATION 5); (SEE VARIATION 2,3 OR 4)	9, 11	023, 026 (GROUND), 023, 024 (SEE VAR. 5), 027, 028	POTENT. TRANSFMR. 116B; MOUNTING INSTRUCTION A,C,F AND E OR G	1-SET OF MATERIAL LISTED FOR VAR. 5 1-SET OF MATERIAL LISTED FOR VAR. 2,3 OR 4 LESS PANEL (ITEM 6)	NONE RECOMMENDED (SEE MOUNTING INSTRUCTION F)	

Fig. 1B – 143 Type Amplifier Input Circuit Variations (Sheet 2)